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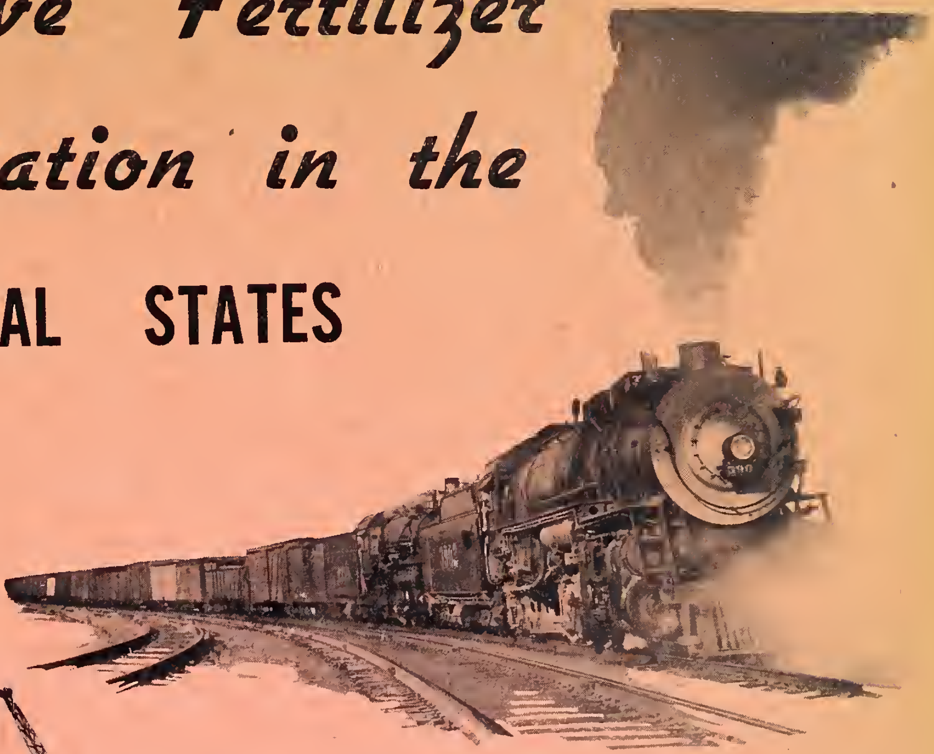
Cooperative Fertilizer Transportation in the
NORTH CENTRAL STATES



BY CLAUD L. SCROGGS
AND ROBERT J. BYRNE

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U. S. DEPARTMENT OF AGRICULTURE

FARMER COOPERATIVE SERVICE
U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

GENERAL REPORT 7

JUNE 1954

FARMER COOPERATIVE SERVICE
U. S. DEPARTMENT OF AGRICULTURE
WASHINGTON 25, D. C.

JOSEPH G. KNAPP, ADMINISTRATOR

*****

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The Farmer Cooperative Service conducts research studies and service activities of assistance to farmers in connection with cooperatives engaged in marketing farm products, purchasing farm supplies, and supplying business services. The work of the Service relates to problems of management, organization, policies, financing, merchandising, quality, costs, efficiency, and membership.

The Service publishes the results of such studies; confers and advises with officials of farmers' cooperatives; and works with educational agencies, cooperatives, and others in the dissemination of information relating to cooperative principles and practices.

SUMMARY

This report gives a graphic presentation of certain transportation cost and other data for the use of farmers in developing a more efficient cooperative fertilizer distribution service in the North Central States.

Transportation costs represent an important part of the total price the farmer pays for fertilizer. Since June 30, 1946, increases of railroad freight rates on selected fertilizer materials to points in the North Central States have ranged from 42 percent for ground phosphate rock to 82 percent on ammonium nitrate.

Florida is the chief source of the phosphate rock used in the North Central States, with Idaho and other Western States ranking second. Phosphate rock moved primarily by rail to cooperative plants or points for bulk distribution in the North Central States.

An increasing volume of such fertilizer materials as triple superphosphate, calcium metaphosphate and ammonia sulphate, move to cooperative plants in the North Central States by barges on the Mississippi River System. Contract water carriers haul much of this tonnage.

Transportation costs per ton of plant nutrients are less when fertilizers are highly concentrated. Thus, the saving in transportation costs favors a program of high analysis plant nutrient distribution. For example, the charges of a Midwestern cooperative for trucking fertilizer from mixing plant to local association, and from the local to the farm, amounted to 11 percent of the total retail price for a 20 unit plant nutrient grade, 7.9 percent for a 30 unit grade, and 6.2 percent for a 40 unit grade.

Almost one-third of the cooperative fertilizer plants in the United States are located in the North Central region. Eighteen of the 34 cooperative fertilizer plants in the North Central region are mixing plants only. Eleven are equipped for both mixing operations and acidulation of rock phosphate for the manufacture of normal superphosphate.

Cooperatives shipped 12 percent of all mixtures and materials reported by plant food manufacturers in the United States for the year ended June 30, 1952. For the West North Central States, cooperatives shipped 22 percent of the fertilizer, while for the East North Central States they shipped 16 percent.

The railroad freight cost for ingredients required for a 10-10-10 fertilizer mixture is $8.75 a ton. This is based on average distances from primary sources which supply ingredients to cooperative fertilizer plants in East North Central States.

Phosphoric acid was distributed in greater volume than any other plant nutrient in the North Central Region.

A comparison of freight rate cost for a ton of phosphoric acid equivalent from Montpelier, Idaho and points in Florida shows on the average, that calcium metaphosphate can be moved from Florida to points in the East North Central States more cheaply than any other phosphorus material from either Florida or Idaho. However, for the West North Central States, calcium metaphosphate from Idaho would be the cheapest source of phosphorous from the standpoint of transportation costs.

Information obtained from two regional cooperative fertilizer plants for the 1952-53 season in the West North Central region showed that about one-third of the tonnage shipped moved in the fall and two-thirds in the spring. Truck shipments accounted for 61 percent in the fall and 67 percent in the spring, with the remainder moving by rail.

COOPERATIVE FERTILIZER TRANSPORTATION IN THE NORTH CENTRAL STATES

By

Claud L. Scroggs*

and

Robert J. Byrne
Transportation Branch

For several years farmer cooperatives in the North Central States have been exploring the possibilities of increasing service to members by integrating all operations from mining to the application of complete plant nutrients on farm fields. To assist these organizations Farmer Cooperative Service has developed technical information, with funds authorized under the Agricultural Marketing Act of 1946, on a number of related problems which have been presented in other reports.[1]

The information provided by these previous reports include detailed data on freight rates and freight rate structures for plant food ingredients used by cooperatives in manufacturing fertilizer. While such freight facts by themselves are useful in transportation plans and programming, they need further interpretation, especially in their effect on the actual price a cooperative member pays for fertilizer. It is the purpose of this report, therefore, to interpret by graphic means some of the more important facts indicated by these freight rate data and thus bring their economic importance into proper focus.

INCREASED FREIGHT CHARGES

Transportation costs represent a substantial part of the total price the farmer pays for fertilizer. Since June 30, 1946, railroad freight rates on fertilizer materials from sources of supply to selected points in the North Central States have increased in amounts ranging from 42 percent for ground phosphate rock to 82 percent on ammonium nitrate. These increases were accounted for by 11 EX Parte (general rate increase) proceedings before the Interstate Commerce Commission.

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*Formerly with Farmer Cooperative Service.

Note: The writers wish to express appreciation to officials of cooperatives in the North Central States and to Martin A. Abrahamsen, Director, Purchasing Division, for helpful suggestions. Valuable assistance also was provided by Kenneth D. Jacob and J. Richard Adams of the Agricultural Research Service.

[1] Abrahamsen, Martin A., Manufacturing Costs as reported for Cooperative Fertilizer Plants in the North Central States. 1949. Farm Cred. Admin. Special Report 218. Feb. 1951. 28 pp.

Scroggs, Claud L., Economic Aspects of Transportation Affecting a Cooperative Fertilizer Program in the North Central States. Farm Cred. Admin. Misc. Report 149. May 1951. 49 pp.

Conyers, Leonard N., Comparative Carload Rail and Inland Water Rates and Distances on Fertilizer Raw Materials from Important Manufacturing and Distributing Centers to Cooperative Fertilizer Manufacturing and Distributing Points in the North Central States. Farm Cred. Admin. Special Report 237 (Revised), January 1952. 15 pp.

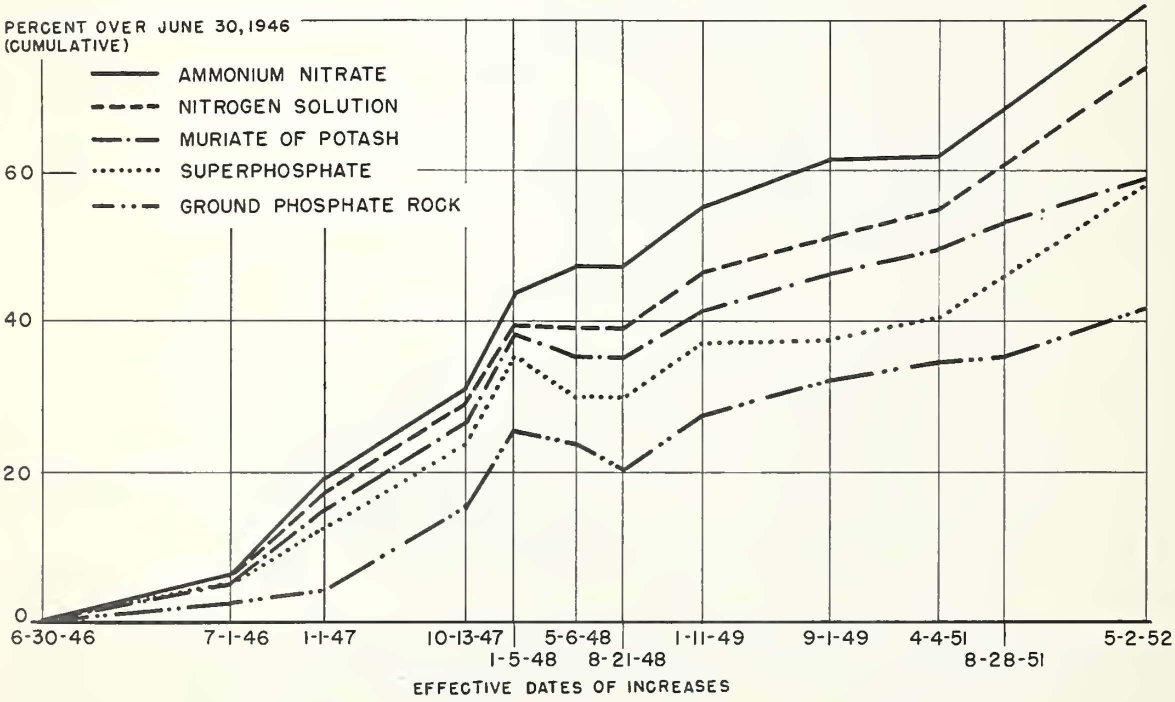
Grab, Eugene G., Hurst, Wilbur M., and Scroggs, Claud L., Cooperative Fertilizer Plants. Farm Cred. Admin. Circular C-145. May 1952. 30 pp.

The average increases (Figure 1) are based on movements of ammonium nitrate from Sheffield, Alabama and ground phosphate rock from Bartow, Fla. to E. St. Louis, Ill., Springfield, Mo., and Dayton, Ohio -- on nitrogen solution from Military, Kans., muriate of potash from Carlsbad, N. Mex., and superphosphate from Bartow, Fla. to E. St. Louis, Ill., Springfield, Mo., St. Paul, Minn., and Dayton, Ohio.

There have been some exceptions to the full percentage increases authorized by the Commission in the Ex Parte proceedings granting these increases. These exceptions, known as "hold-downs", apply on rates established by the Commission and limit the maximum increases to a specified percentage or a specified number of cents per 100 pounds whenever the authorized general percentage increase would exceed that amount. Phosphate rock, for example, has been excepted by "hold-down" provisions from full increases in several of the Ex Parte cases. The increases shown in Figure 1 include these exceptions wherever applicable.

FIGURE 1

AVERAGE INCREASES IN RAIL FREIGHT RATES ON FERTILIZER MATERIALS FROM PRINCIPAL SOURCES OF SUPPLY TO SELECTED POINTS OF MANUFACTURE NORTH CENTRAL STATES



FREIGHT COSTS AND FERTILIZER MATERIAL VALUES

Figure 2 shows the relationship of the simple average freight cost of selected fertilizer materials to prices of: chemical ammoniates, potash at plants, and phosphate rock at mines.[2] The freight cost data were

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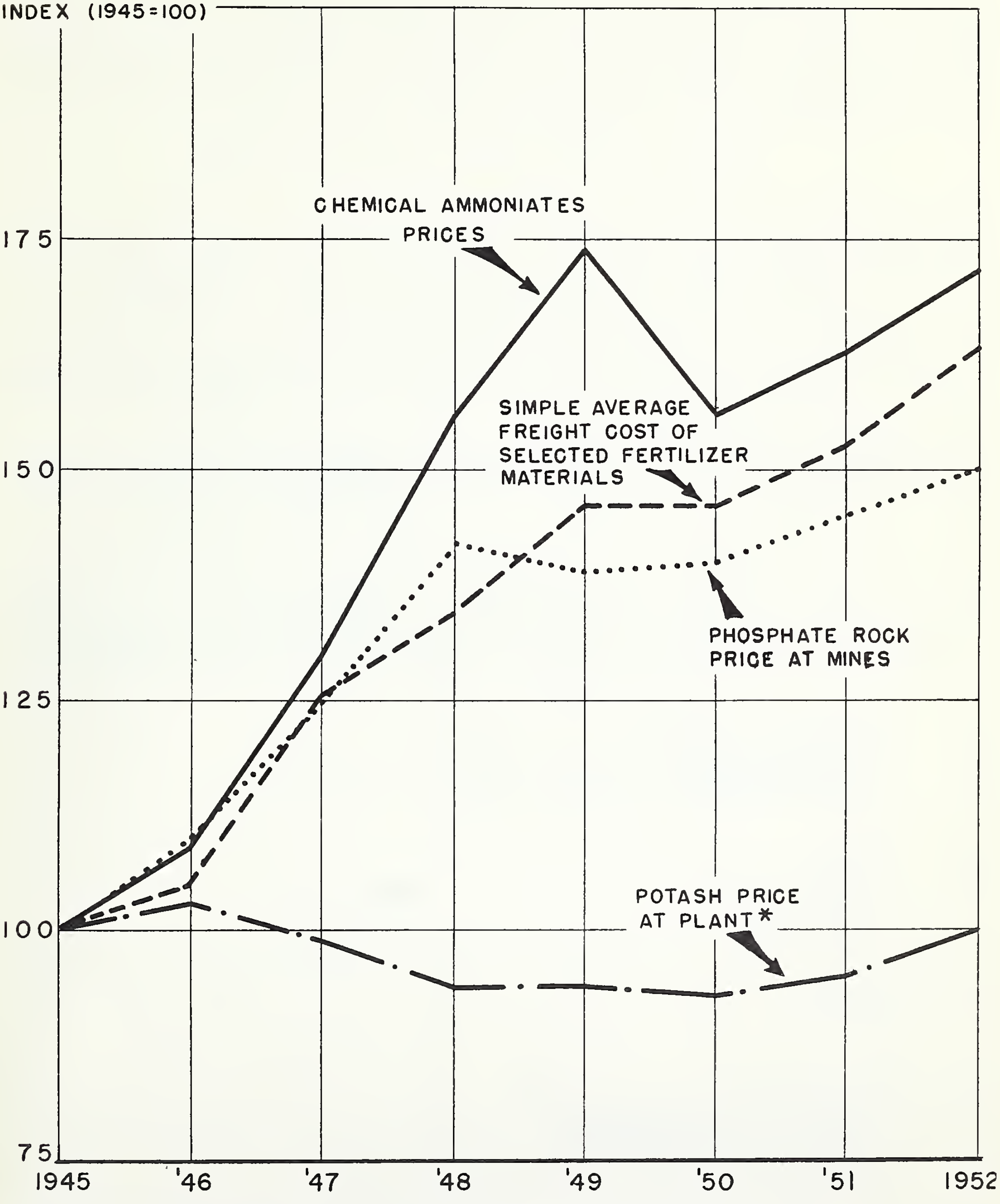
[2] American Potash Institute, Better Crops with Plant Foods, Washington, D. C., January 1952. p. 34. (Supplemental data from U. S. Bur. of Mines.)

FIGURE 2

INDEX OF FREIGHT COSTS AND PRICES FOR SELECTED FERTILIZER MATERIALS, NORTH CENTRAL STATES



*60-62% K_2O MIN. (INCLUDES REFINED POTASH AND SOME 93-96% KCl.)

based on the same origin-to-destination movements of fertilizer materials used in Figure 1.

This chart presents a graphic picture of the changing relationships between transportation costs and prices of fertilizer material. Over the 7-year span potash prices at plant have shown relatively little change. Freight costs have climbed faster since 1945 than has phosphate rock value at mines. Chemical ammoniate prices increased rapidly until 1949, declined in 1950, and since then increased at a less accelerated pace, due in part to increased production at new plants.

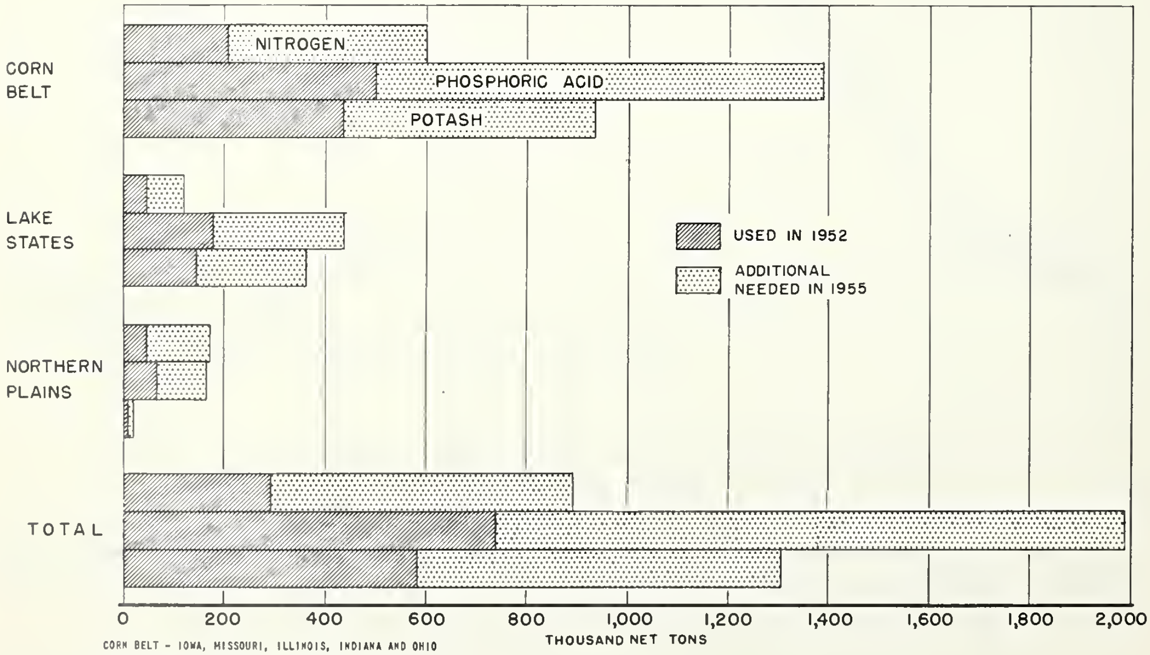
PRIMARY PLANT NUTRIENTS - USAGE AND NEEDS

In planning programs for manufacturing and distributing fertilizer, both short-range and long-range plans of cooperatives must be based on projected estimates of primary plant nutrients that farmers will need in crop production and soil conservation. The amount of fertilizer materials the cooperatives will plan to provide in the form of mixtures or straight materials will depend upon the expected pattern of consumption. These estimates also will serve as a guide for developing such services as bulk spreading of solid materials, and field application of anhydrous ammonium and nitrogen solutions.

The accompanying chart, Figure 3, shows the quantities of primary plant nutrients -- nitrogen, phosphoric acid, and potash -- used in the North

FIGURE 3

QUANTITIES OF PRIMARY PLANT NUTRIENTS USED IN 1952 AND ESTIMATED ADDITIONAL QUANTITIES NEEDED IN 1955, NORTH CENTRAL STATES



CORN BELT - IOWA, MISSOURI, ILLINOIS, INDIANA AND OHIO
LAKE STATES - MINNESOTA, MICHIGAN AND WISCONSIN
NORTHERN PLAINS - N. DAKOTA, S. DAKOTA, NEBRASKA AND KANSAS

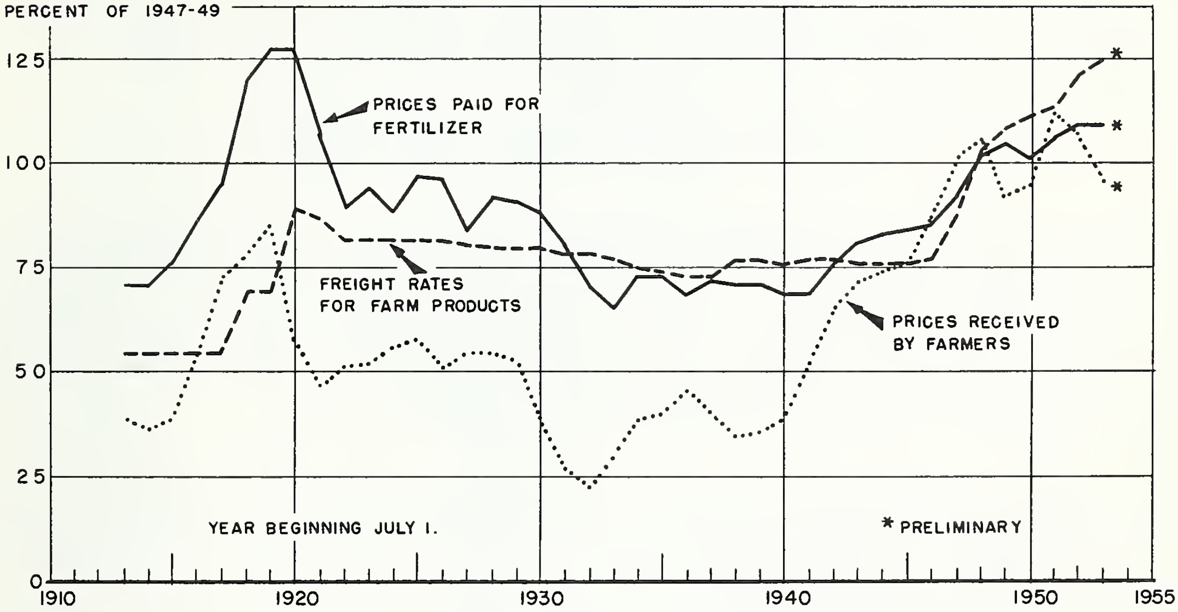
Central States during the year 1952 as well as the projected consumption based on the area's capacity to produce in the year 1955.[3]

RAILROAD FREIGHT RATES, FARM INCOME, AND PRICES PAID FOR FERTILIZER[4]

Prices received by farmers dropped sharply during the 1920-21 crop year, and remained generally low throughout the period between World War I and World War II. During this period, rail freight rates dropped slightly, but not in proportion to the decline in farm income. Prices paid for fertilizer, in general, followed the decline in farm income during this same period (Figure 4).

FIGURE 4

RAIL FREIGHT RATES FOR AGRICULTURAL COMMODITIES, PRICES FARMERS RECEIVED FOR ALL FARM PRODUCTS, AND PRICES PAID FOR FERTILIZER, UNITED STATES



In the period immediately following World War II, freight rates lagged behind rising farm income as well as prices paid for fertilizer. Since then freight rates have been rising while farm income has declined.

RAIL MILEAGES AND PHOSPHATE PLANT FOOD (P_2O_5) NEEDS

Phosphoric acid is one of the most important primary plant nutrients needed in the North Central Region. But shortage of this material has hindered the progress of cooperative fertilizer programs during the past decade. In an effort to remedy this critical shortage, the major regional cooperatives in this area, through membership in Central Farmers Fertilizer Company, Chicago, Ill., are developing phosphate deposits in Southeastern Idaho. Figure 5 indicates the estimated tonnage of phosphate (P_2O_5) needed in the North Central States during 1955.[5] The U. S. Department of Agriculture estimated that Illinois will need approximately 307,000 net tons of P_2O_5, which makes it the biggest market for this particular plant nutrient. From the transportation standpoint, the significant implication here is the form in which these quantities of the primary plant nutrient (P_2O_5) will be provided.

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[3] U. S. Bur. of Agr. Econ. Agriculture's Capacity to Produce. Agriculture Information Bul. 88. June 1952. p. 16.

U. S. Bur. of Plant Industry, Soils and Agricultural Engineering. Commercial Fertilizers Consumption in the United States 1951-52. Table 1.

[4] U. S. Bur. of Agr. Econ. Agricultural Outlook Charts, 1954. Oct. 1953. p. 12. (Supplemental data from U. S. Agricultural Marketing Service).

Also shown are short line mileages from Montpelier, Idaho and East Tampa, Florida to selected fertilizer plants in the North Central Region. Most of the cooperative fertilizer plants in the North Central Region are closer to the Florida phosphate deposits than to the Idaho deposits. However, plants in Minnesota and Iowa, Prairie du Chien, Wis., and St. Joseph, Mo., are nearer Idaho. While distance is but one of many factors in freight rate making, it may be an important consideration between carrier and shipper in securing rate adjustments.

TRANSPORTATION OF PHOSPHATE FERTILIZERS

In 1953 there were 11 cooperative fertilizer plants in the North Central States that acidulated ground phosphate rock for the production of normal superphosphate. They also handled finely ground raw rock phosphate, which is applied directly to the soil. Illinois alone used almost 58 percent of the phosphate rock consumed as plant nutrients in the United States during the fiscal year 1951-52.

The bulk of this phosphate rock originates in Florida with most of the remainder coming from Idaho and other Western States. Concentrated superphosphate, chiefly in the form of triple superphosphate, is manufactured in the phosphate mining area of Florida -- an important source of supply for cooperatives in the North Central States. While shipments from Western sources must move by rail, Florida has a choice as far as concentrated materials are concerned, of shipping by rail or water into the North Central States. However, little or no ground phosphate rock has moved by water to cooperative plants or points for bulk distribution.

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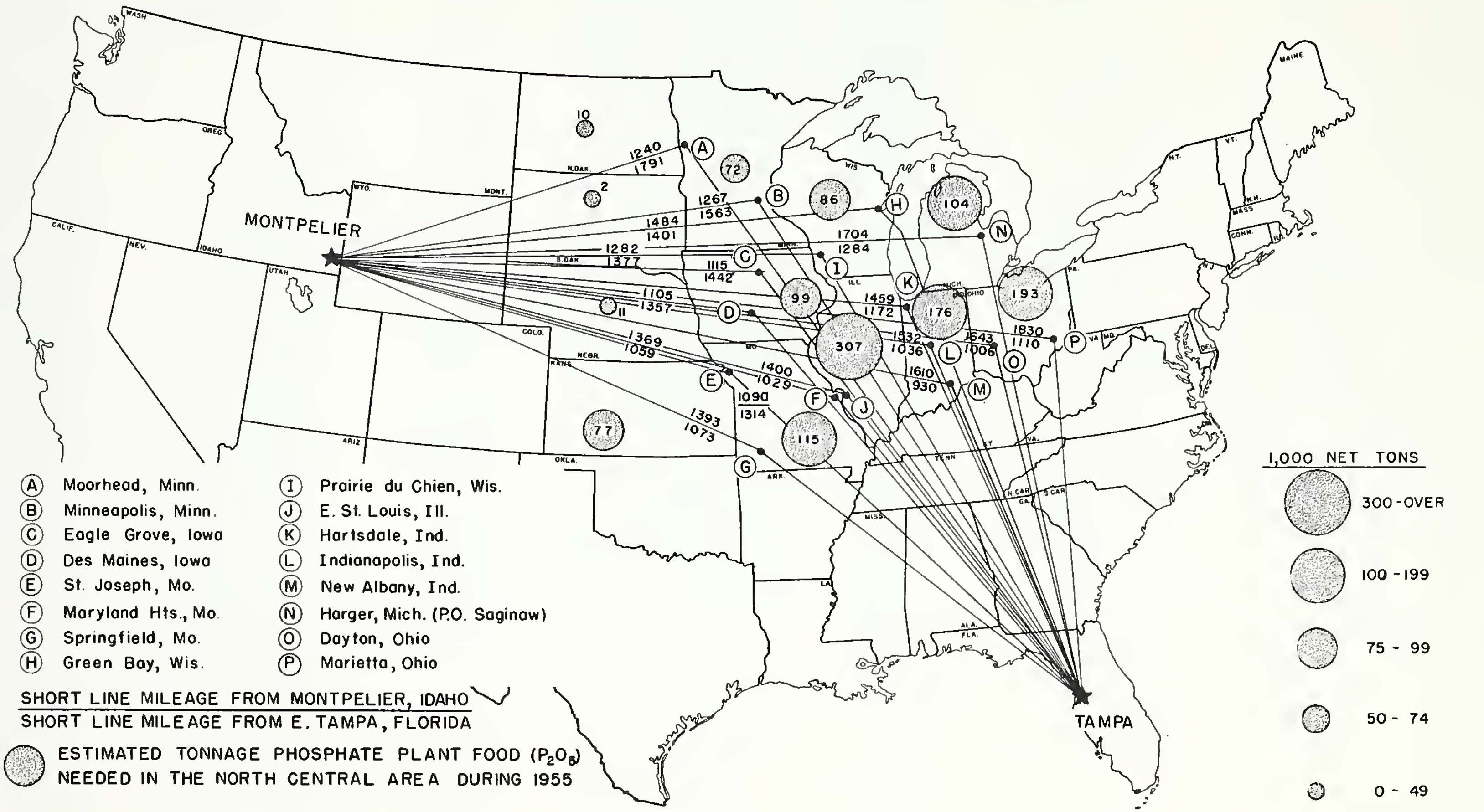
[5] U. S. Bur. of Agr. Econ. Agriculture's Capacity to Produce. Agriculture Information Bul. 88. June 1952, p. 16.

U. S. Bur. of Plant Industry, Soils and Agricultural Engineering. Commercial Fertilizers Consumption in the United States 1951-52. Table 1.

Conyers, Leonard N., Comparative Carload Rail and Inland Water Rates and Distances on Fertilizer Raw Materials from Important Manufacturing and Distributing Centers to Cooperative Fertilizer and Manufacturing and Distributing Points in the North Central States. U. S. Farm Cred. Admin. Special Report 237 (Revised). 15 pp., January 1952.

FIGURE 5

ESTIMATED TONNAGE OF PHOSPHATE PLANT FOOD (P_2O_5) NEEDED DURING 1955 AND RAIL MILEAGES FROM MONTPELIER, IDAHO AND E. TAMPA, FLORIDA, TO SELECTED COOPERATIVE FERTILIZER PLANTS, NORTH CENTRAL STATES



Although freight rates on rock phosphate are lower than on any other form of phosphorus fertilizer shipped by rail, the transportation bill still represents a sizeable part of the total cost of fertilizer. Therefore, freight rates do much to determine the potential trade area in the North Central Region for phosphates originating at Montpelier, Idaho where the cooperative phosphate deposits are being developed. Figure 6 shows comparative rail rates[6] on ground phosphate rock from Montpelier, Idaho and Bartow, Fla. to selected cooperative fertilizer plants in the North Central Region.

These plants acidulate ground phosphate rock into superphosphate ranging from analyses of 18 percent to 32 percent available P_2O_5.[7] The chart shows that freight rates to eight of the eleven cooperative plants are lower from Bartow, Florida than from Montpelier, Idaho, based on rates applicable at that time.

An increasing volume of fertilizer materials is moving to cooperative plants in the North Central Region via barges on the Mississippi River System. Especially is this true of concentrated phosphate fertilizer materials which originate at Sheffield, Alabama and Tampa, Florida.

While the actual barge tonnage of phosphate fertilizer materials for cooperatives is not available, Table 1 shows the phosphate fertilizer traffic on the Mississippi River System (see accompanying map) for the calendar years 1950 and 1951. The table indicates an increased movement during 1951 over 1950, from Gulf Coast ports to destinations on the Mississippi River and from the Ohio to the Missouri River as well as Mississippi destinations from the Missouri River to Minneapolis.

The tonnage increase was greatest on shipments originating on the Mississippi River from New Orleans to the Passes. The fertilizer materials were destined for points between the Missouri River and Minneapolis, and on the Illinois River.

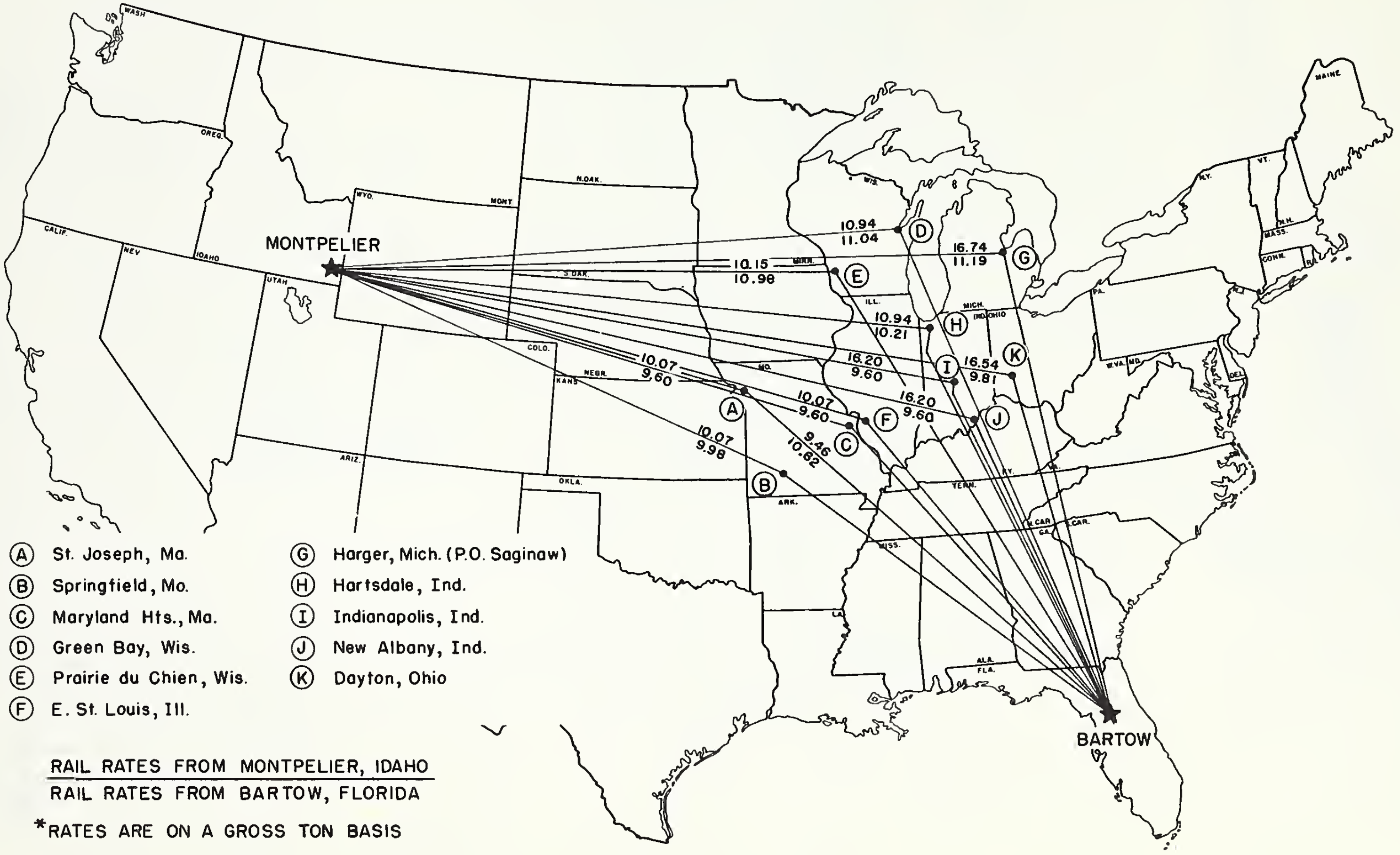
Lower transportation costs by barge versus rail contributed to the increased use of water transportation of phosphate fertilizer materials to points in the North Central Region. Much of this tonnage is carried by contract carriers of dry bulk commodities. Contract carriers carry freight at rates determined by agreement, and do not publish freight rate tariffs, or have regular routes.

[6] Conyers, Leonard N., Comparative Carload Rail and Inland Water Rates and Distances on Fertilizer Raw Materials from Important Manufacturing and Distributing Centers to Cooperative Fertilizer Manufacturing and Distributing Points in North Central States. U. S. Farm Cred. Admin. Special Report 237 (Revised). 15 pp. January 1952. (Ex Parte 175-B increases added).

[7] No triple superphosphate is manufactured by cooperatives in the United States, although one association currently is constructing such facilities.

FIGURE 6

RAIL FREIGHT RATES* ON GROUND PHOSPHATE ROCK FROM MONTPELIER, IDAHO AND BARTOW, FLORIDA, TO SELECTED COOPERATIVE FERTILIZER PLANTS NORTH CENTRAL STATES



Ⓐ St. Joseph, Mo.
Ⓑ Springfield, Mo.
Ⓒ Maryland Hts., Mo.
Ⓓ Green Bay, Wis.
Ⓔ Prairie du Chien, Wis.
Ⓕ E. St. Louis, Ill.
Ⓖ Harger, Mich. (P.O. Saginaw)
Ⓗ Hartsdale, Ind.
Ⓘ Indianapolis, Ind.
Ⓙ New Albany, Ind.
Ⓚ Dayton, Ohio

$\frac{\text{RAIL RATES FROM MONTPELIER, IDAHO}}{\text{RAIL RATES FROM BARTOW, FLORIDA}}$

*RATES ARE ON A GROSS TON BASIS

COMMERCIALLY NAVIGABLE INLAND WATERWAYS OF THE UNITED STATES

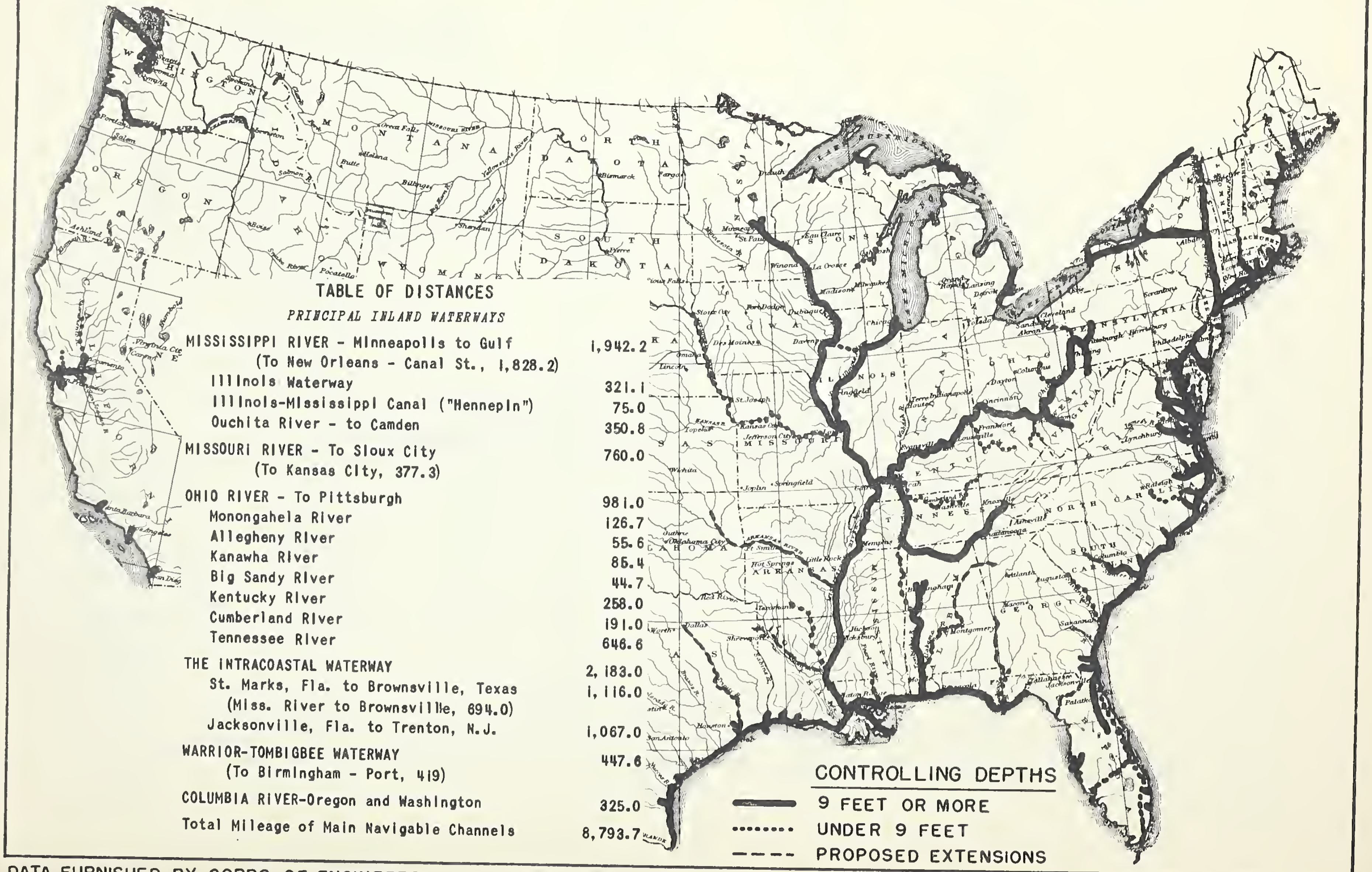


TABLE OF DISTANCES

PRINCIPAL INLAND WATERWAYS

MISSISSIPPI RIVER - Minneapolis to Gulf (To New Orleans - Canal St., 1,828.2)	1,942.2
Illinois Waterway	321.1
Illinois-Mississippi Canal ("Hennepin")	75.0
Ouchita River - to Camden	350.8
MISSOURI RIVER - To Sioux City (To Kansas City, 377.3)	760.0
OHIO RIVER - To Pittsburgh	981.0
Monongahela River	126.7
Allegheny River	55.6
Kanawha River	85.4
Big Sandy River	44.7
Kentucky River	258.0
Cumberland River	191.0
Tennessee River	646.6
THE INTRACOASTAL WATERWAY	2,183.0
St. Marks, Fla. to Brownsville, Texas (Miss. River to Brownsville, 694.0)	1,116.0
Jacksonville, Fla. to Trenton, N.J.	1,067.0
WARRIOR-TOMBIGBEE WATERWAY (To Birmingham - Port, 419)	447.6
COLUMBIA RIVER-Oregon and Washington	325.0
Total Mileage of Main Navigable Channels	8,793.7

DATA FURNISHED BY CORPS OF ENGINEERS, U. S. DEPARTMENT OF THE ARMY.

Since there is no requirement for rate agreements between shipper and carrier to be filed with the Interstate Commerce Commission, no barge rates were available on shipments via contract carriers. Although rates on phosphate fertilizer materials are published on common water carriers, as distinct from contract carriers, they do not indicate the actual charges assessed on most of the phosphate materials now moving by barge. Rates by contract water carriers are generally lower than common carrier barge rates with a still greater margin existing between the contract carrier and rail rates to many points.

An example of the differences existing among the rates applicable via common and contract water carriers and rail carriers is shown in I. & S. Docket No. 5834, submitted Feb. 7, 1951, before the Interstate Commerce Commission. In Exhibits I and 8 of that proceeding, it was shown that the rail rate (at that time) on crude sulphur from Port Sulphur, La., to Dubuque, Iowa, was $9.18 per gross ton. By common carrier barge, the rate was $5.49 per gross ton with a rate of $4.50 per gross ton quoted by a contract water carrier. While this may be an extreme case, it does give some idea of the rate relationship that may exist at a given time.

During the spring of 1953, cooperatives in the North Central Region received barge shipments of triple superphosphate from Tampa, Fla., calcium metaphosphate from Muscle Shoals, Ala., and ammonium sulphate from Houston, Tex. to river points in Wisconsin and Minnesota.

Superphosphate moved to one midwestern cooperative via ocean-going barge from Tampa, Fla., thus eliminating the need for interchange of cargo at New Orleans. The material was unloaded from the barge at destination by conveyor belt and ammoniated as it entered the plant.

Table 1. - *River to river movement of phosphate fertilizer materials on the Mississippi River System, 1950-51*

Shipping area	Receiving area	Net tons	
		1950	1951
Gulf Coast ports	Ohio River to Missouri River	1,200	2,400
	Missouri River to Minneapolis	-	1,043
	Houston Ship Channel, Texas	4,658	-
Mississippi River: New Orleans to the Passes (includes Innerharbor Navigation Canal)	New Orleans to Baton Rouge	1,000	-
	Ohio River to Missouri River	6,954	-
	Missouri River to Minneapolis	11,526	19,870
	Houston Ship Channel, Texas	4,630	4,608
	Illinois River	78,582	134,671
Missouri River to Minneapolis	Missouri River to Minneapolis	1,209	-
Ohio River	Missouri River to Minneapolis	899	-
Tennessee River	Missouri River to Minneapolis	8,525	7,408
	Ohio River	1,997	-

Source: Corps of Engineers, U. S. Army, Board of Engineers for Rivers and Harbors.

TRANSPORTATION COSTS AND FERTILIZER PRICES

A saving in transportation costs is one of the many factors favoring a program of high analysis plant nutrient distribution. Figure 7 compares the percentage costs of outbound freight for three different grades of fertilizer. These percentages are based on actual charges, made by a Midwestern cooperative for trucking fertilizer from its mixing plant to a local association 50 miles away, with the addition of a 10-mile delivery charge from the local to a farm member.

The outbound freight cost accounted for 11 percent of the retail price for the 20-unit grade, for the 30-unit grade, 7.9 percent and for the 40-unit grade, 6.2 percent.[8]

Further examination of Figure 7 indicates the savings to the farm purchaser on cost per unit of plant nutrient. While the low analysis 20-unit grade costs him $2.27 per unit of plant nutrient, the high analysis 40-unit grade costs $2.03 per unit. This is a savings of 24 cents a plant nutrient unit or $9.60 per ton on the high analysis fertilizer.

If a member living 60 miles from his cooperative fertilizer plant, pays a $5 charge for delivery from plant to local cooperative, and local to farm, plus the $8.75 inbound freight costs for the ingredients in a 10-10-10 mixture (Figure 11 on page 18), his total transportation bill would amount to $13.75 for a ton of fertilizer of this grade. This is almost 20 percent of the total cost to the farmer when it retails at $70 a ton.

LOCATION OF COOPERATIVE FERTILIZER PLANTS

Cooperative fertilizer manufacturing in the North Central area has increased in the past 20 years, in response to the needs of the farmers in that area. Their first cooperative fertilizer was manufactured in 1932, when a small-scale mixing plant went into operation. Twenty-one years later, on September 1, 1953, 34 cooperative fertilizer manufacturing facilities were in operation (Figure 8). Most of them, 18, were mixing plants only. Eleven were equipped both for mixing operations and acidulation of rock phosphate to manufacture normal superphosphate. Two nitrogen plants now under construction mark the first step taken by cooperatives in producing nitrogen in the United States.

The North Central region accounted for over 30 percent of the cooperative fertilizer plants in the United States in 1952 (Figure 9). Other cooperative facilities located in States adjacent to the North Central area, as well as elsewhere, could affect the development of a joint program of mining and manufacturing.

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[8] Based on data obtained from Missouri Farmers Association, Columbia, Missouri.

FIGURE 7

RELATIONSHIP OF PLANT TO FARM TRANSPORTATION COSTS AND RETAIL PRICES OF FERTILIZER AS PLANT NUTRIENT UNITS PER TON ARE INCREASED

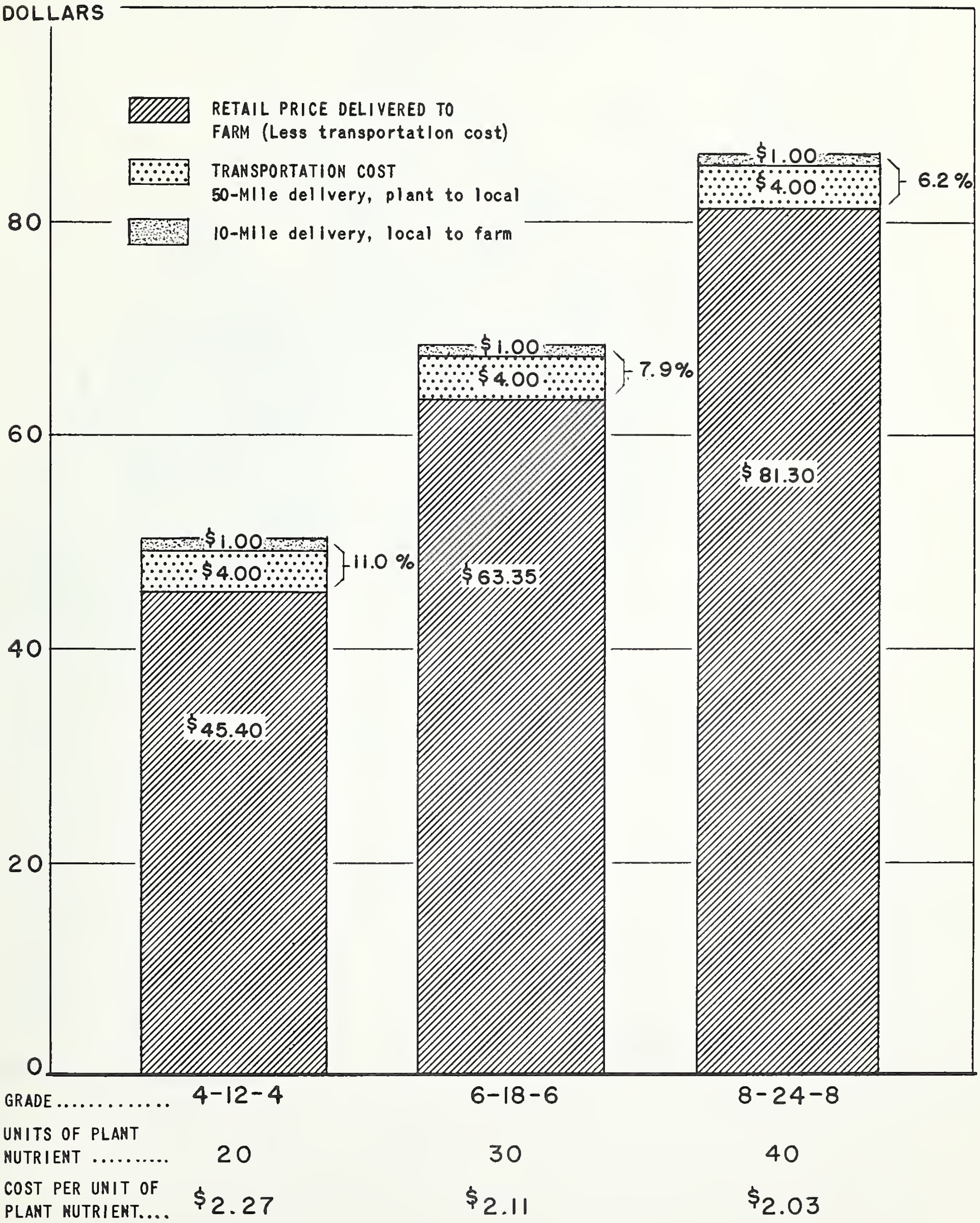
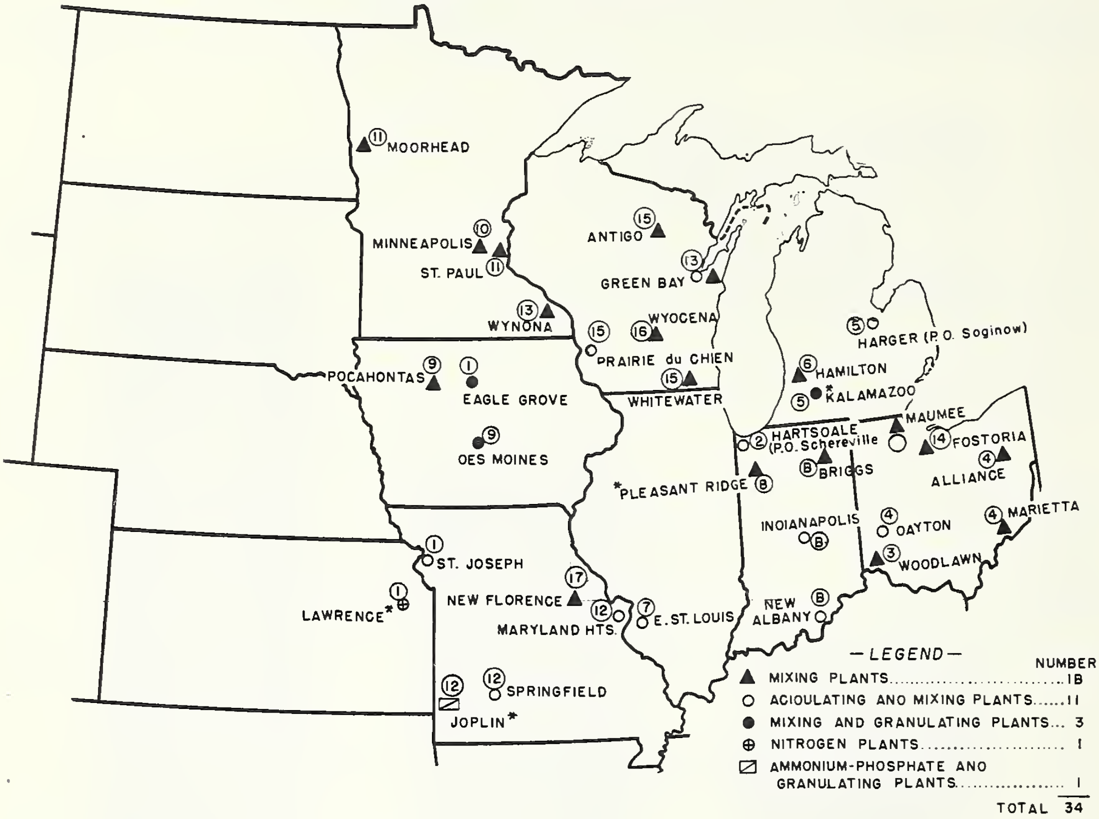


FIGURE 8

COOPERATIVE FERTILIZER PLANTS NORTH CENTRAL STATES SEPTEMBER 1, 1953



— LEGEND —

		NUMBER
▲	MIXING PLANTS	18
○	ACIDULATING AND MIXING PLANTS	11
●	MIXING AND GRANULATING PLANTS	3
⊕	NITROGEN PLANTS	1
▨	AMMONIUM-PHOSPHATE AND GRANULATING PLANTS	1
	TOTAL	34

COOPERATIVE ASSOCIATIONS OPERATING FERTILIZER PLANTS SHOWN ON MAP

1 CONSUMERS COOPERATIVE ASSN., (HQ. KANSAS CITY, MO.)

2 COOPERATIVE PLANT FOODS, INC., (HQ. INDIANAPOLIS, IND.)

3 FARM BUREAU CHEMICAL COOP., INC., (FARM BUREAU COOP. ASSN., INC. HQ. COLUMBUS, OHIO)

4 FARM BUREAU COOPERATIVE ASSN., INC., (HQ. COLUMBUS, OHIO)

5 FARM BUREAU SERVICES, INC., (HQ. LANSING, MICH.)

6 HAMILTON FARM BUREAU COOP., INC., (HQ. HAMILTON, MICH.)

7 ILLINOIS FARM SUPPLY CO., (HQ. CHICAGO, ILL.)

8 INDIANA FARM BUREAU COOP. ASSN., INC., (HQ. INDIANAPOLIS, IND.)

9. IOWA PLANT FOODS CO., (HQ. DES MOINES, IOWA)

10 LAND O'LAKE CREAMERIES, INC., (HQ. MINNEAPOLIS, MINN.)

11 MINNESOTA FARM BUREAU SERVICE CO., (HQ. ST. PAUL, MINN.)

12 MISSOURI FARMERS ASSOCIATION, INC., (HQ. COLUMBIA, MO.)

13 NORTHWEST COOPERATIVE MILLS, INC., (HQ. ST. PAUL, MINN.)

14 OHIO FARMERS GRAIN & SUPPLY ASSN., (HQ. FOSTORIA, OHIO)

15 WISCONSIN FARMCO SERVICE COOP., (HQ. MADISON, WISC.)

16 WYOCENA FARMERS COOPERATIVE CO., (HQ. WYOCENA, WISC.)

17 FARM BUREAU SERVICE CO. OF MISSOURI, INC., (HQ. JEFFERSON CITY, MO.)

NOTE:

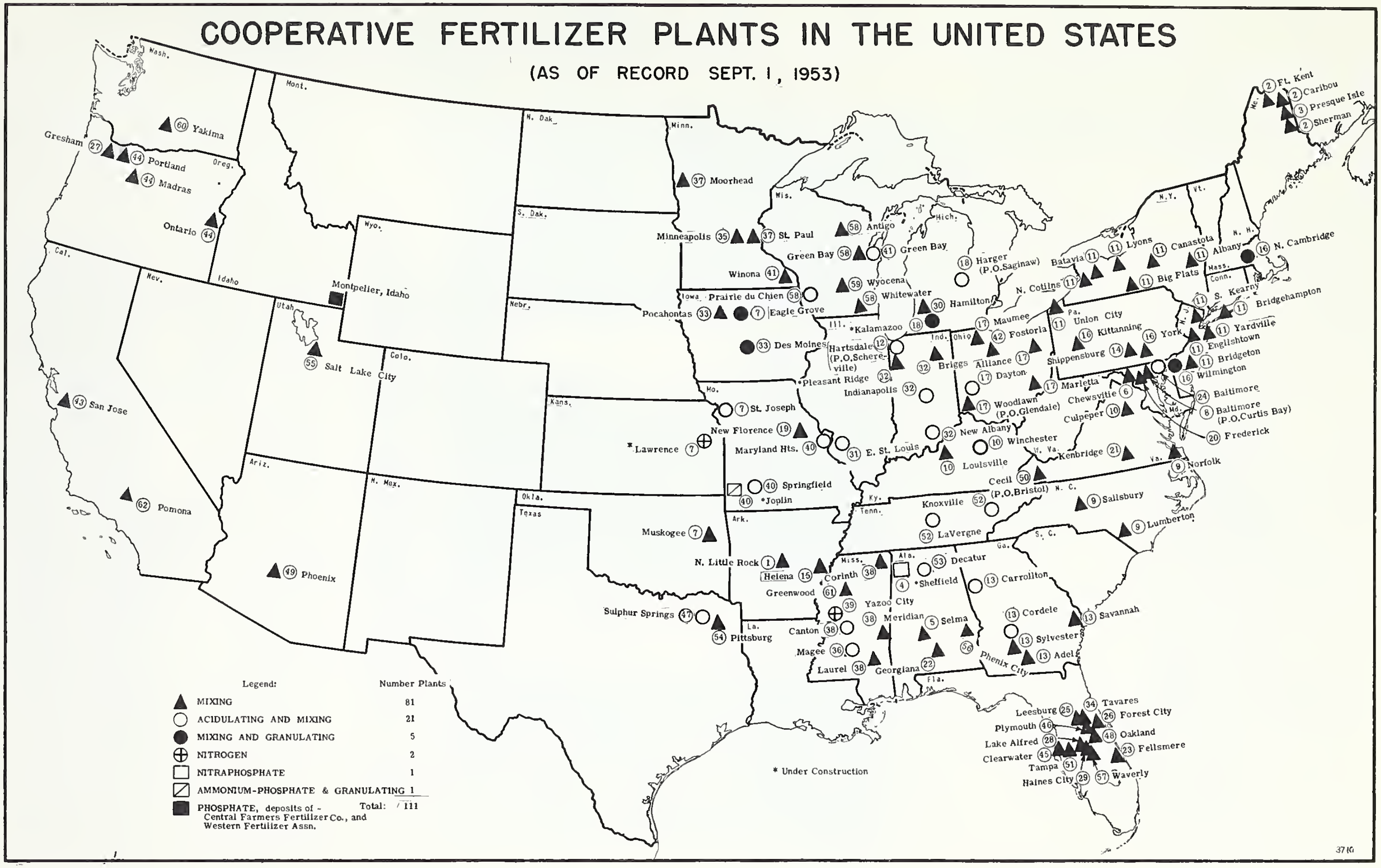
NUMBER OF COOPERATIVE FERTILIZER ASSN. HEADQUARTERS.... 17

NUMBER OF COOPERATIVE FERTILIZER PLANTS.................. 34

* UNDER CONSTRUCTION

Compiled by Farmer Cooperative Service, USDA, Washington, D. C.

FIGURE 9


COOPERATIVE FERTILIZER PLANTS IN THE UNITED STATES
(AS OF RECORD SEPT. 1, 1953)
Wash.
Oreg.
Cal.
Nev.
Idaho
Mont.
Wyo.
Utah
Colo.
Ariz.
N. Mex.
N. Dak.
S. Dak.
Nebr.
Kans.
Okla.
Texas
Minn.
Iowa
Mo.
Ark.
La.
Wis.
Ill.
Mich.
Ind.
Ohio
Ky.
Tenn.
Miss.
Ala.
Ga.
Fla.
S. C.
N. C.
Va.
W. Va.
Md.
Pa.
N. J.
N. Y.
Vt.
N. H.
Mass.
Conn.
Me.
⑥⓪ Yakima
Gresham ㉗
㊹ Portland
㊹ Madras
Ontario ㊹
Montpelier, Idaho
㊺ Salt Lake City
㊸ San Jose
(62) Pomona
㊾ Phoenix
㊲ Moorhead
Minneapolis ㉟
㊲ St. Paul
Winona ㊶
Iowa Prairie du Chien (58)
Pocahontas ㉝
⑦ Eagle Grove
㉝ Des Moines
⑦ St. Joseph
New Florence ⑲
*Lawrence ⑦
Maryland Hts. ㊵
㉛ E. St. Louis
㊵ Springfield
㊵ *Joplin
Muskogee ⑦
N. Little Rock ①
Helena ⑮
Sulphur Springs ㊼
(54) Pittsburg
(58) Antigo
Green Bay (58)
㊶ Green Bay
(59) Wyocena
(58) Whitewater
*Kalamazoo ⑱
Hartsdale ⑫ (P.O.Schererville)
*Pleasant Ridge ㉜
Indianapolis ㉜
㉜ Briggs
⑱ Harger (P.O.Saginaw)
㉚ Hamilton
⑰ Maumee
㊷ Fostoria
Alliance ⑰
⑰ Dayton
⑰ Woodlawn (P.O.Glendale)
⑰ Marietta
㉜ New Albany
⑩ Winchester
⑩ Louisville
Cecil ㊿ (P.O.Bristol)
Knoxville (52)
(52) LaVergne
(53) Decatur
④ *Sheffield
Corinth ㊳
Greenwood (61)
㊴ Yazoo City
㊳ Meridian
Canton ㊳
Magee ㊱
Laurel ㊳
⑤ Selma
(56)
Georgiana ㉒
⑬ Carrollton
⑬ Cordele
⑬ Sylvester
⑬ Adel
Phenix City
⑬ Savannah
Leesburg ㉕
㉞ Tavares
㉖ Forest City
Plymouth ㊻
㊽ Oakland
Lake Alfred ㉘
㉓ Fellsmere
Clearwater ㊺
Tampa (51)
Haines City ㉙
(57) Waverly
Batavia ⑪
⑪ Lyons
⑪ Canastota
⑪ Albany
⑯ N. Cambridge
N. Cotilns ⑪
⑪ Big Flats
⑪ Union City
⑯ Kittanning
Shippensburg ⑭
⑯ York
⑪ S. Kearny
⑪ Bridgehampton
⑪ Yardville
⑪ Englishtown
⑪ Bridgeton
⑯ Wilmington
Chewsville ⑥
Culpeper ⑩
㉔ Baltimore
⑧ Baltimore (P.O.Curtis Bay)
⑳ Frederick
Kenbridge ㉑
⑨ Norfolk
⑨ Salisbury
⑨ Lumberton
② Ft. Kent
② Caribou
③ Presque Isle
② Sherman
* Under Construction
Legend:
Number Plants
▲ MIXING 81
○ ACIDULATING AND MIXING 21
● MIXING AND GRANULATING 5
⊕ NITROGEN 2
□ NITRAPHOSPHATE 1
▨ AMMONIUM-PHOSPHATE & GRANULATING 1
■ PHOSPHATE, deposits of - Central Farmers Fertilizer Co., and Western Fertilizer Assn.
Total: 111
3716

COOPERATIVE ASSOCIATIONS OPERATING FERTILIZER PLANTS SHOWN ON MAP

① Arkansas Farmers Plant Food Co., (Hq. N. Little Rock, Ark.)

② Aroostock Federation of Farmers, (Hq. Caribou, Maine)

③ Aroostook Hi-Test Fertilizer Co., (Hq. Presque Isle, Maine)

④ Associated Cooperative, Inc., (Hq. Sheffield, Alabama)

⑤ Centrala Farmers Co-op., Inc., (Hq. Selma, Alabama)

⑥ Chewsville Co-Operative Assn., Inc. (Hq. Chewsville, Md.)

⑦ Consumers Cooperative Assn., (Hq. Kansas City, Missouri)

⑧ Cooperative Fertilizer Service of Baltimore (Hq. Richmond, Va.)

⑨ Cooperative Fertilizer Service of Norfolk, Inc., (Hq. Richmond, Va.)

⑩ Cooperative Fertilizer Service of Richmond, Inc., (Hq. Richmond, Va.)

⑪ Cooperative GLF Exchange, Inc., (Hq. Ithaca, New York)

⑫ Cooperative Plant Foods, Inc., (Hq. Indianapolis, Ind.)

⑬ Cotton Producers' Assn., (Hq. Atlanta, Ga.)

⑭ Cumberland Valley Cooperative Assn., (Hq. Shippensburg, Pa.)

⑮ Delta Fertilizer Company, (Hq. Helena, Ark.)

⑯ Eastern States Farmers' Exchange, Inc. (Hq. W. Springfield, Mass.)

⑰ The Farm Bureau Cooperative Assn., Inc., (Hq. Columbus, Ohio)

⑱ Farm Bureau Services, Inc., (Hq. Lansing, Mich.)

⑲ Farm Bureau Service Co. of Missouri, Inc. (Hq. Jefferson City, Missouri)

⑳ Farmers Cooperative Assn., Inc., (Hq. Frederick, Md.)

㉑ Farmers' Cooperative Fertilizer Purchasers, Inc. (Hq. Kenbridge, Virginia)

㉒ Farmers Union Fertilizer Co-op., Inc., (Hq. Georgiana, Alabama)

㉓ Fellsmere Sugar Producers' Assn., (Hq. Fellsmere, Florida)

㉔ Fertilizer Mfg. Cooperative, Inc.
  - Cooperative GLF Exchange, Inc. (Hq. Ithaca, N.Y.)
  - Cooperative Fertilizer Service of Baltimore, (Hq. Richmond, Va.)
  - The Farm Bureau Cooperative Assn. Inc. (Hq. Columbus, O.)

㉕ Foremost Fertilizer Company, (Hq. Leesburg, Florida)

㉖ Fosgate Growers Coop., (Hq. Orlando, Florida)

㉗ Gresham Berry Growers, (Hq. Gresham, Oregon)

㉘ Growers Fertilizer Cooperative, (Hq. Lake Alfred, Florida)

㉙ Haines City Citrus Growers Assn., (Hq. Haines City, Fla.)

㉚ Hamilton Farm Bureau Cooperative, Inc., (Hq. Hamilton, Mich.)

㉛ Illinois Farm Supply Co., (Hq. Chicago, Illinois)

㉜ Indiana Farm Bureau Cooperative Assn., Inc. (Hq. Indianapolis, Ind.)

㉝ Iowa Plant Foods Co., (Hq. Des Moines, Iowa)

㉞ Lake Region Packing Assn., (Hq. Tavares, Fla.)

㉟ Land O'Lake Creameries, Inc., (Hq. Minneapolis, Minn.)

㊱ Magee Cooperative Gin, (AAL) (Hq. Magee, Miss.)

㊲ Minnesota Farm Bureau Service Co., (Hq. St. Paul, Minn.)

㊳ Mississippi Federated Cooperatives (AAL), (Hq. Jackson, Mississippi)

㊴ Mississippi Chemical Corp. (Hq. Yazoo City, Mississippi)

㊵ Missouri Farmers Association, Inc., (Hq. Columbia, Missouri)

㊶ Northwest Cooperative Mills, Inc., (Hq. St. Paul, Minn.)

㊷ Ohio Farmers Grain & Supply Assn., (Hq. Fostoria, Ohio)

㊸ Orchard Supply Co., (Hq. San Jose, California)

㊹ Pacific Supply Cooperative, (Hq. Walla Walla, Washington)

㊺ Pinellas Growers Assn., (Hq. Clearwater, Fla.)

㊻ Plymouth Citrus Growers, Assn., (Hq. Plymouth, Fla.)

㊼ Red Star Fertilizer Co., (Hq. Consumers Cooperatives Associated, Amarillo, Texas)

㊽ South Lake Apopka Citrus Growers, Assn., (Hq. Oakland, Fla.)

㊾ Southwest Cooperative Wholesale, (Hq. Phoenix, Ariz.)

㊿ Southwest Va. Cooperative, Inc., (Hq. Lebanon, Va.)

(51) Superior Fertilizer Co., (Hq. Tampa, Fla.)

(52) Tennessee Farmers Cooperative, (Hq. Nashville, Tenn.)

(53) Tennessee Valley Cooperatives, (Hq. Decatur, Ala.)

(54) Texas Cotton Cooperative Assn., (Hq. Dallas, Texas)

(55) Utah Cooperative Assn. (A Farmers Union Affiliate, S. L. City, Utah)

(56) Chavala Cooperative, Inc., (Hq. Phenix City, Ala.)

(57) Waverly Growers' Cooperative, (Hq. Waverly, Fla.)

(58) Wisconsin Farmco Service Cooperative, (Hq. Madison, Wisconsin)

(59) Wyocena Farmers Cooperative Co., (Wyocena, Wisc.)

(60) Yakima Valley Spray Co., (Yakima Fruit Growers Assn., Hq. Yakima, Washington)

(61) Staple Cotton Cooperative Assn., (Hq. Greenwood, Miss.)

(62) Pomona Fertilizer Co. (Hq. Pomona, Calif.)

Note:
Total Number of Cooperative Association Headquarters-------62
Total Number of Cooperative Fertilizer Plants------------- 111

Compiled by The Cooperative Research and Service Division, Farm Credit Administration
U. S. Department of Agriculture, Washington, D. C.

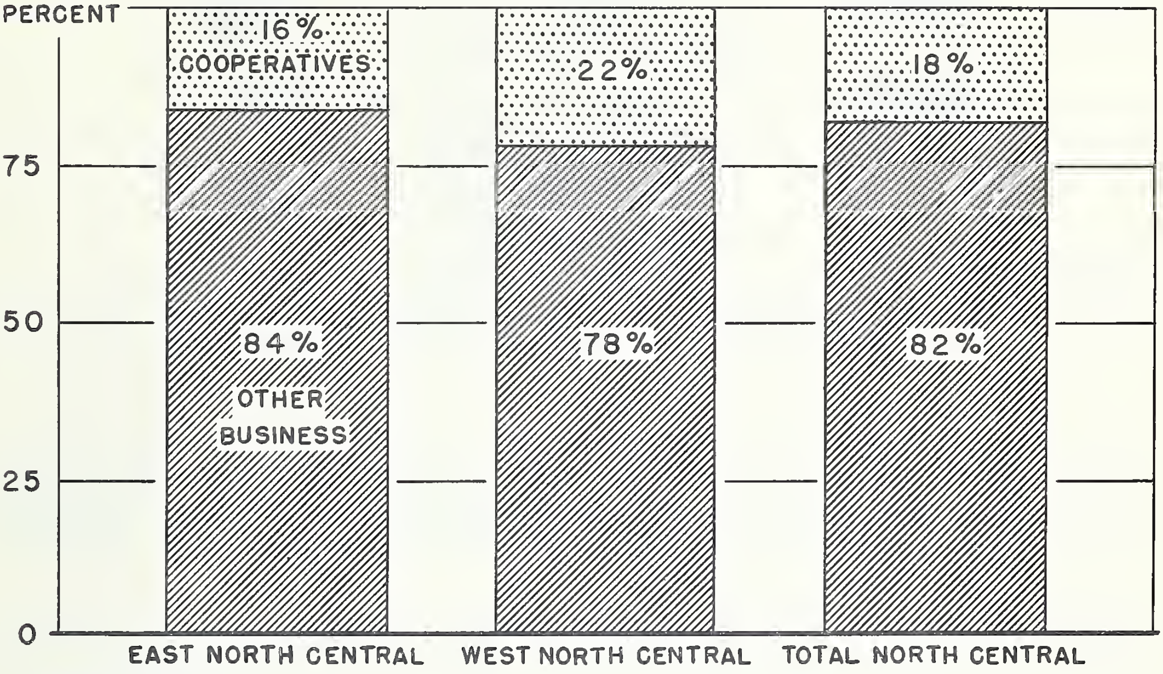
3710

SHIPMENTS FROM COOPERATIVE AND NON-COOPERATIVE MANUFACTURERS[9]

Cooperatives shipped 12 percent of all mixtures and materials reported by fertilizer manufacturers in the United States for the year ended June 30, 1952. Figure 10 shows the percentage of shipments, by cooperative and other businesses, for the North Central area. For the West North Central States, cooperatives had 22 percent of the fertilizer shipments, while for the East North Central States cooperatives had 16 percent of the shipments.

FIGURE 10

PERCENTAGE OF COMMERCIAL FERTILIZER SHIPMENTS FROM COOPERATIVE AND OTHER BUSINESSES, NORTH CENTRAL STATES 1951-52*



*PRELIMINARY

INBOUND FREIGHT COSTS FOR ONE MIXTURE

Figure 11 shows the railroad freight costs, the number of pounds and average miles for transported ingredients required in one formulation of a 10-10-10 fertilizer mixture.[10] The freight costs and miles shipped are based on the average distance to cooperative fertilizer manufacturing plants in the East North Central States.

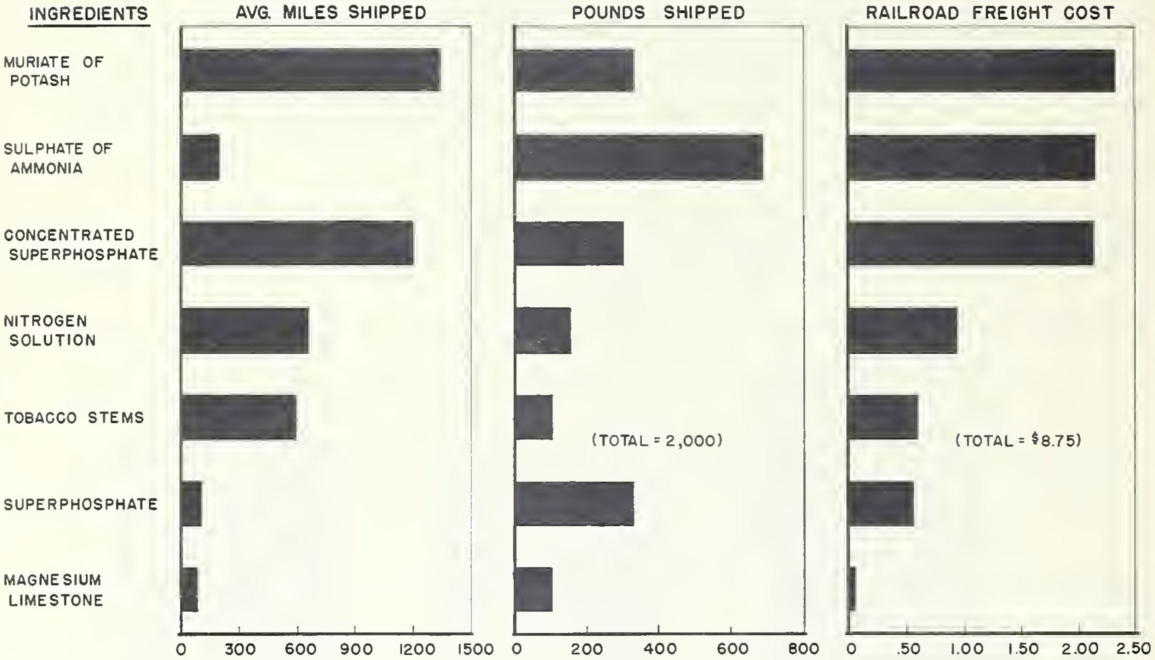
[9] U. S. Bur. of Plant Industry, Soils, and Agricultural Engineering, Commercial Fertilizers Consumption in the United States 1951-52. Table 1 (Supplemental data from Farmer Cooperative Associations in the North Central Region).

[10] Conyers, Leonard N., Comparative Carload Rail and Inland Water Rates and Distances on Fertilizer Raw Materials from Important Manufacturing and Distributing Centers to Cooperative Fertilizer Manufacturing and Distributing Points in North Central States. U. S. Farm Cred. Admin. Special Report 237 (Revised). 15 pp., January 1952 (Ex Parte 175-B increases added).

Supplemental data from U. S. Bur. of Plant Industry, Soils and Agricultural Engineering.

FIGURE 11

RAILROAD FREIGHT COSTS FROM PRIMARY SOURCE OF SUPPLY FOR INGREDIENTS REQUIRED FOR 10-10-10 FERTILIZER MIXTURE BASED ON AVERAGE DISTANCE, EAST NORTH CENTRAL STATES



In making these comparisons an assumption is made that magnesium limestone moves by rail. In actual practice, however, limestone generally is trucked to the fertilizer mixing plants from local quarries. Potash from New Mexico and superphosphate from Florida originate at the most distant points of all ingredients.

Calculated on the basis of a weighted average, the ingredients for this mixture originated approximately 273 miles from the hypothetical fertilizer mixing facilities. For this particular formulation, a freight cost from point of origin to mixing plant is calculated at $8.75 per ton.

COMPARISON OF FREIGHT COSTS FOR A TON OF PHOSPHORIC ACID (P_2O_5) EQUIVALENT[11]

Data in Figure 12 show the comparison of freight costs for a ton of phosphoric acid equivalent from Montpelier, Idaho and points in Florida

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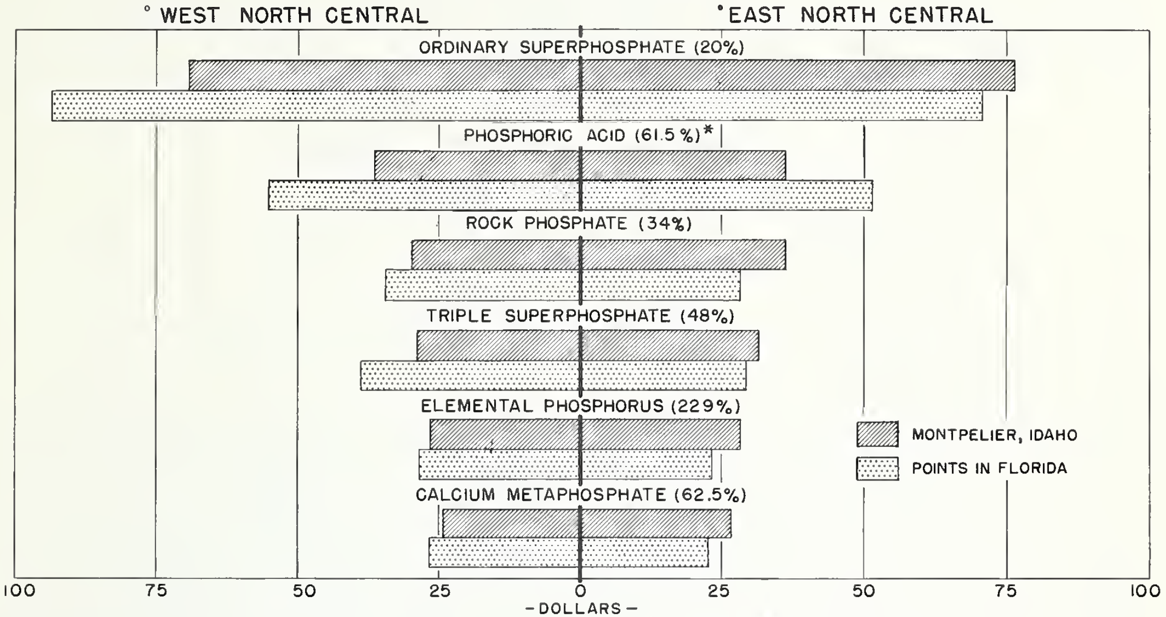
[11] Conyers, Leonard N., Comparative Carload Rail and Inland Water Rates and Distances on Fertilizer Raw Materials from Important Manufacturing and Distributing Centers to Cooperative Fertilizer Manufacturing and Distributing Points in North Central States. U. S. Farm Cred. Admin. Special Report 237 (Revised). 15 pp., January 1952 (Ex Parte 175-B increases added).

Supplemental data from U. S. Bur. of Plant Industry, Soils and Agricultural Engineering.

FIGURE 12

COMPARATIVE FREIGHT COSTS FROM MONTPELIER, IDAHO AND POINTS IN FLORIDA TO NORTH CENTRAL STATES FOR TON OF PHOSPHORIC ACID (P_2O_5) EQUIVALENT



*MONTPELIER, IDAHO, 55% PHOSPHATIC FERTILIZER SOLUTION

° Minnesota, Iowa, Missouri, South Dakota, North Dakota, Nebraska, and Kansas

• Ohio, Indiana, Illinois, Michigan, and Wisconsin

to East North Central and West North Central areas. Supporting tables on which the figure was based are also included in Tables 2 and 3.

Since 20 percent ordinary superphosphate requires 5 tons to make one ton of phosphoric acid (P_2O_5) it ranks highest in freight costs from Idaho and Florida points. On the average, calcium metaphosphate can be moved from Florida to points in the East North Central States more cheaply than any other phosphorus material from either Florida or Idaho. For the West North Central areas, calcium metaphosphate originating from Idaho would be the cheapest source of phosphorus from the standpoint of transportation cost. Next lowest in freight cost under the same situations is elemental phosphorus.

Elemental phosphorus, however, must be further processed to produce phosphoric acid. This, in turn, is used in acidulation of raw rock phosphate which also must be brought to the point of manufacture. In the case of calcium metaphosphate further processing may or may not be required depending upon the form in which it is to be used.

Advantages that may be reflected for one material over another from the transportation standpoint, however, may be nullified by differences in mining cost and power cost for processing.

Table 2. - *Freight cost from Montpelier, Idaho and points in Florida to selected points in North Central States for ton of phosphoric acid (P_2O_5) equivalent*

Commodity	To East North Central States		To West North Central States	
	From Montpelier, Idaho	From Points in Florida	From Montpelier, Idaho	From Points in Florida
20% Ordinary superphosphate	$76.45	$70.60	$69.00	$93.55
34% Rock phosphate--------	36.46	28.22	29.40	34.10
61.5% P_2O_5 (85% H_3PO_4)-----	36.31	51.36	36.25	55.49
48% Triple superphosphate--	31.80	29.37	28.70	38.92
229% Elemental phosphorus--	28.25	23.23	26.22	28.25
62.5% Calcium metaphosphate	26.91	22.91	24.29	26.70

Note: Based on 60,000 lb. min. carload rail rates which include authorized increases In Ex Parte 175-B.

Table 3. - *Weight required to make a ton of phosphoric acid (P_2O_5) equivalent*

Commodity	Tons
20% Ordinary superphosphate---------------	5.00
34% Rock phosphate-----------------------	2.94
48% Triple superphosphate----------------	2.08
61.5% P_2O_5 (85% H_3PO_4)*------------------	1.82
62.5% Calcium metaphosphate---------------	1.60
229% Elemental phosphorus----------------	.44

*(Points in Florida -- 61.5% phosphoric acid.
(Montpelier, Idaho -- 55% phosphatic fertilizer solution.

FERTILIZER DISTRIBUTION - PLANT TO FARM

Fertilizer distribution methods at the local level are becoming increasingly diversified. Cooperative fertilizer shipments vary by season, kind of fertilizer, and form and type of transport. The needs of the area and the service demands of farmers determine these distribution methods.

Information was obtained from two regional cooperative fertilizer plants in the West North Central Region regarding fertilizer shipments -- including those moving directly from regional plant to farms. Over 200 million pounds of fertilizer were shipped from the two plants during the fall 1952 and spring 1953 seasons. About one-third moved in the fall and the remaining two-thirds in the spring. The greatest percentage moved by truck, as shown by the following percentage distribution of the total weight of fertilizer shipped during the Fall 1952 and Spring 1953 seasons:

Method of shipment	Season	
	Fall 1952	Spring 1953
	Percent	*Percent*
Truck----------------------	61	67
Rail-----------------------	39	33

Nine percent of the total weight shipped in the fall and 2.3 percent in the spring moved directly to the farm. The remainder went to local warehouses or other storage points before shipment to farms.

On the basis of number of shipments, the percentage moving by truck from the two plants was much greater than by rail -- over 90 percent in both fall and spring seasons. While trucks hauled over 90 percent of the fertilizer shipments from the plants, it amounted to a little over 60 percent on the basis of weight as shown in the preceeding table.

Rail shipments of fertilizer from the plants are primarily in carload lots while many of the shipments by truck are in smaller truckload or less-than-truckload lots. This explains the higher percentage on the basis of truck shipments as shown in the following table:

Method of shipment	Season	
	Fall 1952	Spring 1953
	Percent	*Percent*
Truck----------------------	91	92
Rail-----------------------	9	8

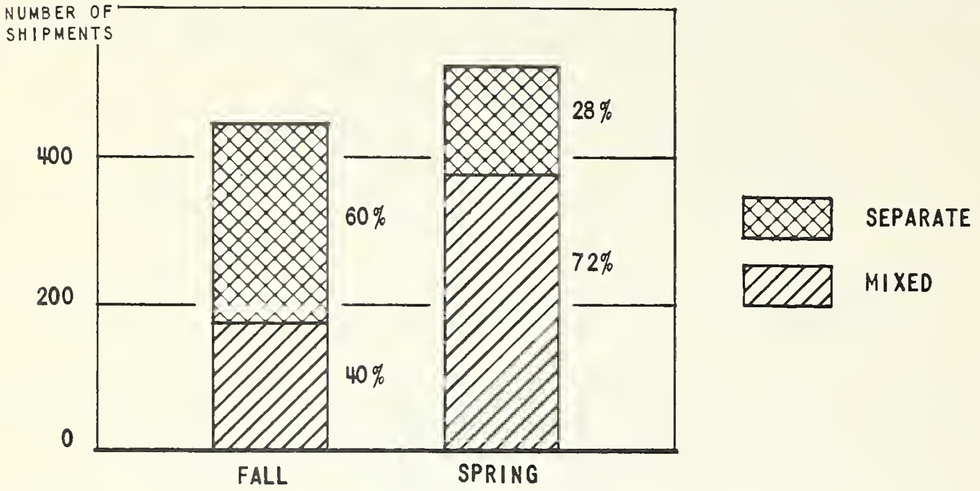
The percentage of shipments moving directly to the farm was 10.2 percent in the fall and 5 percent in the spring.

TRUCK SHIPMENTS

The percentage of fertilizer moved by truck direct from plant to farm was comparatively small. There were 447 truck shipments direct from plant to farm during the fall period, with each shipment traveling an average of 34.4 miles. For the Spring, there were 526 truck shipments traveling an average of 17.8 miles.

Fertilizer mixtures made up 40 percent of the truck shipments from the two plants in the fall and 72 percent in the spring.

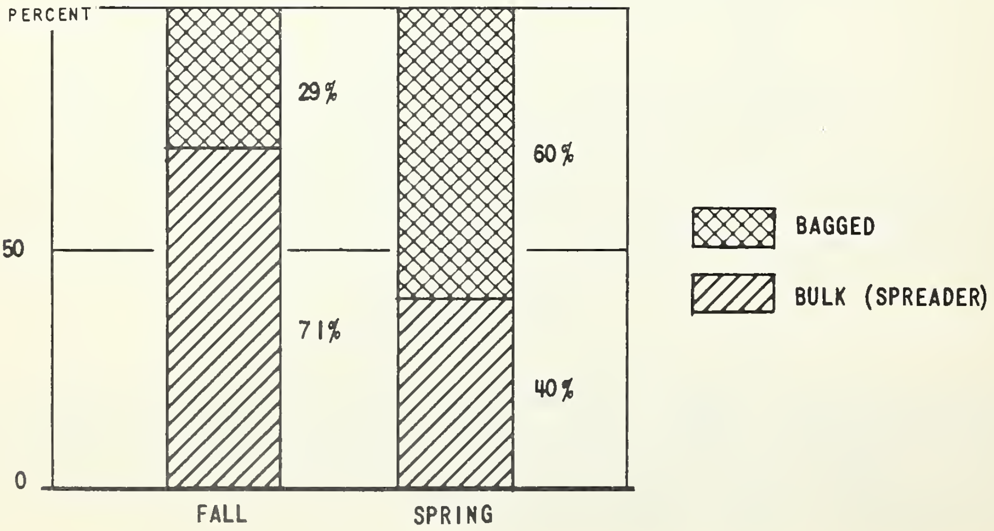
PERCENTAGE OF TRUCK SHIPMENTS OF FERTILIZER, BY KIND, AS REPORTED BY TWO COOPERATIVE PLANTS, WEST NORTH CENTRAL STATES, FALL 1952 AND SPRING 1953



FORM OF SHIPMENT

Distribution of bulk fertilizer by spreader truck is increasing in the North Central States, as it offers many possibilities for savings -- savings in time and labor to the farmer and additional savings on bags and handling costs. Bulk shipments made up 71 percent of the truck shipments from two cooperative plants in the Fall of 1952 and 40 percent in the Spring of 1953.

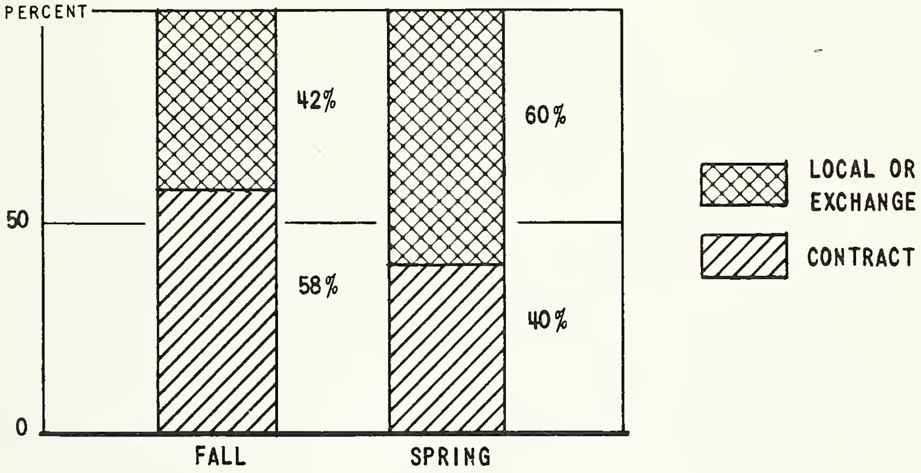
PERCENTAGE OF TRUCK SHIPMENTS OF FERTILIZER, BY FORM OF SHIPMENT, AS REPORTED BY TWO COOPERATIVE PLANTS, WEST NORTH CENTRAL STATES, FALL 1952 AND SPRING 1953



TRUCK OWNERSHIP

The two plants distributed fertilizer to farms either by for-hire contract truckers or by trucks owned by local cooperatives in whose area the distribution was made. The following chart shows that contract truckers hauled 60 percent of the fall and 40 percent of the spring truck shipments. Exchange or local cooperative-owned trucks hauled the remainder.

PERCENTAGE OF TRUCK SHIPMENTS OF FERTILIZER, BY TYPE OF TRUCK OWNERSHIP, AS REPORTED BY TWO COOPERATIVE PLANTS, WEST NORTH CENTRAL STATES, FALL 1952 AND SPRING 1953



Services of contract haulers were required more often during the Fall season when farmer members purchased the larger volume of bulk ground rock phosphate for direct application to fields and pastures.